

Claims

1. A multi cylinder thick materials pump (1) for providing concrete in particular, whose at least two feeding cylinders (3, 5) feed the thick material from a pre filling container (7) into a feed line, having a shift valve (9) for alternatively connecting the feeding cylinders with the feed line associated with it, comprising at least two moveable valve bodies (15, 17), each comprising a transfer section (15L, 17L) between each of the feeding cylinders and the feed line, connected downstream of the feeding cylinders to a collector tube (19),
characterized in, that the shift valve (9) comprises at least one, but preferably two substantially translatorically movable control slides (15, 17), each of them comprising a straight transfer section (15L, 17L), for connecting each of their associated feeding cylinders (3, 5) with the feed line, and a section blocking the connection.
2. Thick materials pump according to claim 1,
characterized in, that the shift valve (9) comprises a guidance structure (11) for the control slides (15, 17), having openings for passing through thick materials flows.
3. Thick materials pump according to claim 2,
characterized in, that the guidance structure (11) is mounted into the pre filling container (7) in a fixed manner, so that the control slides (15, 17) and their inlet openings are always in contact with the thick material filled in.
4. Thick materials pump according to claims 2 or 3,
characterized in that the guidance structure (11) is substantially provided shaped as a box or as a frame, forming a separate guide for each control slide (15, 17).
5. A thick materials pump according to one of the preceding claims, **characterized in, that** the control slides (15, 17) can each be positioned within the guidance

structure (11) in at least two different positions, thus a transfer position, wherein the feeding cylinder can eject into the collector tube (19), and a blocking- or inlet position wherein the feeding cylinder can suck thick material out of the pre filling container (7).

6. Thick materials pump according to one of the preceding claims, **characterized in, that** the control slides (15, 17) are made identically.

7. Thick materials pump according to one of the preceding claims **characterized in, that** a control slide (15, 17) is divided into three sections along its stroke, one of which being the transfer section (15L, 17L) and another one being an inlet section (15E, 17E).

8. Thick materials pump according to claim 7,
characterized in, that between the transfer section and the inlet section a blocking section (15B, 17B) without through flow function is provided.

9. Thick materials pump according to claim 7 or 8,
characterized in, that the sections of the control slides (15, 17) are provided as single modules and in particular connected to each other in a disconnectable manner.

10. Thick materials pump according to one of the claims 1 thru 9,
characterized in, that the guidance structure (11) comprises at least one flap (13) for removing thick material from the transfer section of a control slide (15, 17).

11. Thick materials pump according to claim 10,
characterized in, that a common flap is provided for several control slides (15, 17).

12. Thick materials pump according to one of the preceding claims, **characterized in, that** the control slides (15, 17) are driveable and positionable independently from each other, in particular through hydraulic lifting cylinders.

13. Thick materials pump according to claim 12,
characterized in, that as a drive for the control slide a tandem lifting cylinder array (21) within two serially connected lifting cylinders (25, 27) is provided, whose respective stroke corresponds to the travel of the control slide from one position into the neighboring position.
14. Thick materials pump according to claim 12
characterized in, that as a drive for the control slide a telescoping lifting cylinder (31) with two lifting stages is provided, each of them corresponding to the travel of the control slide from one position into the neighboring position.
15. Thick materials pump according to claim 13 or 14,
characterized in, that the lifting cylinders are located in parallel next to the control slides, coupled with them via consoles (29, 35), wherein the guidance structure (11) comprises the control slide guides for these consoles.
16. Thick materials pump according to one of the preceding claims, **characterized in, that** the transfer section (15L, 17L) of control slide (15, 17) comprises a cylindrical tube with the same diameter as the feeding cylinders.
17. Thick materials pump according to claim 7, **characterized in, that** in the inlet section (15E, 17E) of the control slide a rerouting system (15S, 17S) is provided.
18. Thick materials pump according to one of the preceding claims, **characterized in, that** it comprises a control unit, to which the momentary positions of the shift valve and the control slides as well as of the feeding pistons of the feeding cylinders are provided by position indicators and which controls the drives of the control slides and of the feeding pistons according to a predetermined time distance pattern in a cyclical manner.

19. A process for operating a thick materials pump, in particular a thick materials pump (1) according to one of the preceding claims, for continuous feeding, the thick materials pump comprising at least two open feeding cylinders (3, 5) with feeding pistons (K3, K5) and a shift valve (9) with control slides (15, 17), controllable independently from each other, adapted to the motion of the feeding pistons, each comprising at least one transfer section (15L, 17L) for connecting an associated feeding cylinder with a feed line and an intake section (15E, 17E) for sucking in thick material from a pre filling container (7) through the associated feeding cylinder (3, 5), wherein a synchronous travel phase of the feeding pistons (K3, K5) is controlled in a cyclical manner, while its at least two control slides (15, 17) are located in a transfer position, wherein its transfer sections (15L, 17L) connect the associated feeding cylinders to the feed line for preliminary simultaneous expulsion of thick material.

20. A process according to claim 19, wherein the feeding pistons (K3, K5) in the synchronous phase are adjusted to each other, so that the thick materials quantity pumped by them simultaneously is approximately equal to feeding through one piston (K5 or K3) alone during the suction stroke of the respective other piston (K3 or K5).

21. A process according to claim 19 or 20, wherein at the beginning of the pump stroke of each feeding piston (K3, K5) of each feeding cylinder (3, 5) its opening is momentarily closed through the blocking section (15B, 17B) of the control slides and this piston performs a pre compression stroke.

22. A process according to claim 21,
characterized in, that each pump stroke of a piston comprises at least a pre compression phase (phases 4 / 8), a first synchronous phase (phases 1 / 5) a pump phase (phases 2 to 4 / 6 to 8) and a second synchronous phase (phase 5 / 1).

23. A process according to one of the preceding process claims, **characterized in, that** during the synchronous phase both feeding pistons (K3, K5) are driven at the same speed, in particular at half the normal speed of their further pump stroke.
24. A process according to one of the preceding claims, **characterized in, that** upon a pump stroke a transition phase (phase 2 / 6) with a stand still of a feeding piston during a continuing pump stroke of the other feeding piston follows.
25. A process according to one of the preceding process claims, **characterized in, that** the suction stroke of each piston (phase 3 / 7) is faster than its pump stroke, in particular between a transition phase (phase 2 / 6) and a pre compression phase (phase 4 / 8).
26. A process according to claim 25, **characterized in, that** each suction stroke of a piston comprises a start ramp and a stop ramp with a reduced velocity.
27. A process according to one of the preceding process claims, **characterized in, that** the control slides (15, 17) are slowed down or stopped momentarily during the synchronous phases.
28. A process according to one of the preceding process claims, **characterized in, that** the control slides (15, 17) are slowed down or stopped momentarily in a pre compression phase.
29. A process according to one of the preceding process claims, **characterized in, that** the control slides (15, 17) are slowed down, or stopped momentarily in a transition phase.

30. A process according to one of the preceding process claims, **characterized in, that** the control slides (15, 17) are slowed down or stopped momentarily in a suction phase.

31. A process according to one of the preceding process claims, **characterized in that** the control slides (15, 17) are positioned in a operating position in the operational pauses of the thick materials pump, allowing the removal of remaining thick material and the insertion of a cleaning body when required.

32. A process according claim 31, **characterized in, that** the operational position is the inlet position of the control slide.

33. A process according to claim 31 or 32, **characterized in, that** a safety device for preventing the starting of the control slide is activated during the removal and/or insertion process.

Summary

Piston Pump for Thick Materials

In a multi cylinder thick materials pump (1) for feeding concrete in particular, whose at least two feeding cylinders (3, 5) feed the thick material from a pre filling container (7) into a feed line, having a shift valve (9) for alternatively connecting the feeding cylinders with the feed line associated with it, the shift valve (9) **according to the invention** comprising at least two valve bodies (15, 17), movable in a substantially translatoric manner, each comprising a straight transfer section (15L, 17L), connectable in a transfer position downstream of the supply cylinder to a collector tube (19), for connecting the respectively associated supply cylinder (3,5) with the feed line.

A process for operating this thick material pump for continuous feed operation is also described.